

WHAT IS CLAIMED IS:

1. A separation cartridge comprising:
  - a first separation medium;
  - a second separation medium positioned adjacent to the first separation medium; and
    - a frame configured to hold the first and second separation mediums;
    - wherein the separation cartridge is configured to separate one or more entrained substances from a gas stream in a hood system.
- 10 2. The separation cartridge of claim 1 wherein the first and second separation mediums are selected from a group consisting of a baffle, a packed bed, a mesh filter, and combinations thereof
3. The separation cartridge of claim 2 wherein at least one of the separation mediums is a packed bed.
- 15 4. The separation cartridge of claim 3 wherein the packed bed is pleated.
5. The separation cartridge of claim 3 wherein the packed bed comprises inorganic media.
- 20 6. The separation cartridge of claim 5 wherein a mean dimension of a particle in the media approximately 0.1 millimeters to approximately 100 millimeters.
7. The separation cartridge of claim 5 wherein the media includes particles comprising a plurality of sizes.

8. The separation cartridge of claim 5 wherein the media is substantially solid.

9. The separation cartridge of claim 5 wherein the media is substantially porous and comprises an exterior surface and a plurality of channels that open onto the exterior surface and define internal surfaces.

10. The separation cartridge of claim 9 wherein the channels comprise a mean size of approximately 0.01 microns to approximately 10 microns.

11. The separation cartridge of claim 9 wherein the porous inorganic particles are approximately 15% porous to approximately 95% porous.

12. The separation cartridge of claim 11 wherein the porous inorganic particles are approximately 30% porous to approximately 70% porous.

15 13. The separation cartridge of claim 1 wherein the first separation medium comprises a plurality of entry openings and a plurality of exit openings, the entry and exit openings being at least substantially offset so that at least a substantial portion of a gas passing through the entry openings is deflected before passing through the exit openings.

20 14. The separation cartridge of claim 1 wherein a primary mechanism used by the first separation medium to separate the entrained substances from a gas stream is impaction.

25 15. The separation cartridge of claim 14 wherein a mechanism or mechanisms used by the second separation medium to separate the entrained substances from a gas stream is selected from a group

consisting of impaction, absorption, adsorption, sieving, and combinations thereof.

16. The separation cartridge of claim 1 wherein the first separation medium is in contact with the second separation medium.

5 17. The separation cartridge of claim 1 wherein the separation cartridge is approximately 2.5 centimeters to approximately 6.4 centimeters wide.

10 18. The separation cartridge of claim 17 wherein the separation cartridge is approximately 3.8 centimeters to approximately 4.8 centimeters wide.

19. The separation cartridge of claim 1 wherein the hood system is a kitchen hood system.

20. The separation cartridge of claim 1 further comprising a third separation medium.

15 21. The separation cartridge of claim 1 wherein one or both of the first and second separation mediums is configured to be easily removed from the frame.

22. The separation cartridge of claim 1 wherein the first and second separation mediums and the frame are fixedly coupled together.

20 23. The separation cartridge of claim 1 wherein the frame encloses the first and second separation mediums.

24. The separation cartridge of claim 1 wherein the first separation medium is configured to be received by upper and lower railings in the hood system and the second separation medium is

configured to protrude outward from a plane defined by the upper and lower railings.

25. The separation cartridge of claim 24 wherein the separation cartridge is approximately 6.35 centimeters to approximately 19 centimeters wide.

26. The separation cartridge of claim 1 wherein a height of a first portion of a side of the separation cartridge is greater than a height of a second portion of the side of the separation cartridge, the first portion of the side corresponds to a portion of the separation cartridge that comprises the first separation medium and the second portion of the side corresponds to a portion of the separation cartridge that comprises the second separation medium, the first portion of the side being configured to be received by upper and lower railings of a hood.

27. The separation cartridge of claim 1 wherein the first separation medium comprises:

a first plate comprising entry openings; and  
a second plate comprising exit openings, the second plate being spaced apart from the first plate;

wherein the entry and exit openings are configured so that at least a portion of the gas stream is deflected as it passes through the openings in the first and second plates.

28. The separation cartridge of claim 27 wherein the space between the first and second plates is approximately 0.3 centimeters to approximately 2.5 centimeters.

25           29. A separation cartridge comprising:  
a separation medium;  
a packed bed; and

a frame configured to hold the separation medium and the packed bed;

wherein the separation cartridge is configured to separate an entrained substance from a fluid stream.

5        30.      The separation cartridge of claim 29 wherein the separation medium is a baffle and the fluid stream is a gas stream.

31.      The separation cartridge of claim 29 wherein the packed bed comprises inorganic media.

10       32.      The separation cartridge of claim 31 wherein a mean dimension of a particle in the media is approximately 0.1 millimeters to approximately 100 millimeters.

33.      The separation cartridge of claim 31 wherein the media includes particles comprising a plurality of sizes.

15       34.      The separation cartridge of claim 31 wherein the inorganic media comprises particles that are substantially solid.

35.      The separation cartridge of claim 31 wherein the inorganic media comprises particles that are substantially porous.

20       36.      The separation cartridge of claim 35 wherein the particles comprise an exterior surface and a plurality of channels that open onto the exterior surface and define internal surfaces, the channels having a mean size of approximately 0.01 microns to approximately 10 microns.

37.      The separation cartridge of claim 35 wherein the particles are approximately 15% porous to approximately 95% porous.

38. The separation cartridge of claim 37 wherein the particles are approximately 30% porous to approximately 70% porous.

39. The separation cartridge of claim 35 wherein the porous inorganic particles are substantially composed of metals and their oxides.

5 40. The separation cartridge of claim 29 wherein the packed bed is pleated.

41. The separation cartridge of claim 29 wherein the separation medium separates the entrained substance from the fluid stream primarily by impaction.

10 42. The separation cartridge of claim 29 wherein the separation medium comprises a mesh filter.

43. The separation cartridge of claim 29 wherein the separation medium and/or packed bed is configured to be easily removed from the separation cartridge.

15 44. A separation cartridge comprising:

a plurality of separation mediums; and  
a frame configured to hold the plurality of separation mediums;

20 wherein the separation cartridge is configured to separate an entrained substance from a gas stream.

45. The separation cartridge of claim 44 wherein at least one of the plurality of separation mediums comprises a mesh filter.

46. The separation cartridge of claim 44 wherein at least one of the plurality of separation mediums comprises a baffle.

47. The separation cartridge of claim 44 wherein at least one of the plurality of separation mediums comprises a plurality of perforated plates.

48. The separation cartridge of claim 44 wherein at least one of  
5 the plurality of separation mediums comprises a packed bed including inorganic media.

49. The separation cartridge of claim 44 wherein the separation cartridge is configured to be used in conjunction with a hood system.

50. A separation apparatus comprising:  
10 a first plate comprising entry openings; and  
a second plate comprising exit openings, the second plate being spaced apart from the first plate;  
wherein the separation apparatus is configured to separate an entrained substance from a gas stream;  
15 wherein the entry and exit openings are configured to be offset so that at least a portion of the gas stream passing through the entry openings is deflected before passing through the exit openings.

51. The separation apparatus of claim 50 further comprising:  
a separation medium positioned adjacent to the first and/or  
20 second plates; and  
a frame configured to hold the separation medium and the first and/or second plates.

52. The separation apparatus of claim 51 wherein the separation medium is a packed bed.

25 53. The separation apparatus of claim 51 wherein the separation apparatus is configured to be positioned in a hood system.

54. The separation apparatus of claim 50 wherein the first and second plates each comprise an open area of approximately 20% to approximately 60%.

55. The separation apparatus of claim 54 wherein the first and second plates each comprise an open area of approximately 30% to approximately 50%.

56. The separation apparatus of claim 50 wherein one or both the entry openings and exit openings are collared.

10 57. The separation apparatus of claim 56 wherein the collared openings are tapered.

58. The separation apparatus of claim 56 wherein the plates are configured so that both the entry and exit openings are collared and so that the collared portion of the openings face each other.

15 59. The separation apparatus of claim 58 wherein the collared portion of the entry openings on the first plate extend past the collared portion of the exit openings on the second plate.

60. The separation apparatus of claim 50 wherein one or both the entry openings and exit openings are louvers.

20 61. The separation apparatus of claim 50 wherein the entry openings are substantially uniformly positioned on the first plate and the exit openings are substantially uniformly positioned on the second plate.

62. The separation apparatus of claim 50 wherein the entry openings and exit openings are substantially round and/or substantially rectangular.

63. The separation apparatus of claim 50 wherein the offset percentage of the entry openings and exit openings is at least approximately 80%.

64. The separation apparatus of claim 50 wherein the separation apparatus is configured to be included in a system comprising:  
5                   a hood;  
                      ductwork coupled to the hood; and  
                      a fan coupled to the ductwork, the fan being configured to move air from the hood through the ductwork;  
10                  wherein the separation apparatus is coupled to the hood.

65. A separation apparatus comprising:  
                     at least three plates positioned adjacent to one another, each of the plates comprises openings;  
                      wherein the plates are configured to separate an entrained substance from a gas stream in a hood system.  
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66. The separation apparatus of claim 65 further comprising:  
                     a separation medium positioned adjacent to at least one of the plates; and  
                      a frame that is configured to hold the separation medium and  
20                the three plates.

67. The separation apparatus of claim 66 wherein the separation medium is a packed bed.

68. The separation apparatus of claim 65 wherein the plates are configured so that at least a portion of the gas stream is deflected as it  
25                passes through the openings in the plates.

69. The separation apparatus of claim 65 wherein the plates comprise openings that are substantially round, substantially louvered, and/or substantially rectangular.

70. The separation apparatus of claim 65 wherein the openings 5 on at least one plate are collared.

71. The separation apparatus of claim 70 wherein the collared openings are tapered.

72. The separation apparatus of claim 70 wherein the plates are configured so that the openings are collared on at least two plates and so 10 that the collared portions of the openings face each other.

73. The separation apparatus of claim 72 wherein the collared portions of the openings on the facing plates extend past each other.

74. The separation apparatus of claim 65 wherein the offset percentage for the combination of all of the plates is not less than 15 approximately 90%.

75. The separation apparatus of claim 65 wherein the open area of each of the plates is approximately 20% to approximately 60%.

76. The separation apparatus of claim 65 wherein the separation apparatus is configured to be included in a separation cartridge.

77. The separation apparatus of claim 65 wherein the entry 20 openings are substantially uniformly positioned on the first plate and the exit openings are substantially uniformly positioned on the second plate.

78. A separation system comprising:  
a hood;

ductwork coupled to the hood;  
a fan coupled to the ductwork, the fan being configured to move air including at least one entrained substance from the hood through the ductwork; and  
5 a separation cartridge coupled to the hood and/or ductwork, the separation cartridge including:  
a plurality of separation mediums; and  
a frame configured to hold the separation mediums.

79. The separation system of claim 78 wherein the separation  
10 mediums are capable of being easily removed from the frame.

80. The separation system of claim 78 wherein the separation mediums are selected from a group consisting of a baffle, a packed bed, and a mesh filter.

81. The separation system of claim 78 wherein one of the  
15 plurality of separation mediums is a packed bed comprising porous inorganic media.

82. The separation system of claim 78 wherein one of the plurality of separation mediums is a packed bed comprising solid inorganic media.

20 83. The separation system of claim 78 wherein the separation cartridge is approximately 2.5 centimeters to approximately 19 centimeters wide.

84. The separation system of claim 78 wherein the plurality of separation mediums separate the entrained substances from the air using  
25 one or more of the following mechanisms: impaction, absorption, adsorption, and/or sieving.

85. A separation system comprising:  
a hood;  
ductwork coupled to the hood;  
a fan coupled to the ductwork, the fan being configured to  
5 move air from the hood through the ductwork; and  
a separation apparatus coupled to the hood and/or ductwork,  
the separation apparatus comprising:  
a first plate comprising entry openings; and  
a second plate comprising exit openings, the second  
10 plate being spaced apart from the first plate;  
wherein the entry and exit openings are configured to be at  
least substantially offset so that at least a substantial portion of the air  
passing through the entry openings is deflected before passing through  
the exit openings.
- 15 86. The separation system of claim 85 wherein the first and  
second plates each comprise an open area of approximately 20% to  
approximately 60%.
87. The separation system of claim 85 wherein the separation  
cartridge further comprises:  
20 a separation medium positioned adjacent to the first and/or  
second plates; and  
a frame that is configured to hold the separation medium and  
the first and/or second plates.
88. The separation apparatus of claim 85 wherein one or both  
25 the entry openings and exit openings are collared.
89. The separation apparatus of claim 88 wherein the collared  
openings are tapered.

90. The separation apparatus of claim 88 wherein the plates are configured so both the entry and exit openings are collared and so that the collared portion of the openings face each other.

91. The separation apparatus of claim 85 wherein the entry  
5 openings are substantially uniformly positioned on the first plate and the exit openings are substantially uniformly positioned on the second plate.

92. A separation cartridge comprising:  
a first means for separating an entrained substance from a  
gas stream using a baffle and/or a mesh filter;  
10 a second means for separating an entrained substance from  
a gas stream using a packed bed; and  
a frame configured to hold the first and second means.